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INSECTS IN RELATION
TO
NATIONAL DEFENSE

Circular 11

COCKROACHES



February 1941

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INTRODUCTION

Roaches may become troublesome in any establishment where foods are stored, cooked or served. They are most abundant in kitchens, storerooms and dining halls. The commissary departments of camp and vessels are very attractive to them. They can be very destructive to library books by eating the starches and glues from the bindings and they may gnaw holes in clothing. The pollution of foods over which they run may place them in the role of disease carriers.

The offensive, sickening or fetid odor associated with cockroaches is due largely to an oily liquid secreted by scent glands. This oil leaves the characteristic roachy odor wherever the insects are abundant. Food is ruined by it and dishes over which roaches run may seem apparently clean, yet give off the odor when warmed unless thoroughly washed in hot water and soap. The pellets of excrement, as well as the ink-like liquid emitted by roaches from their mouths, contribute to the development of the nauseating odor.

HOW ROACHES GET INTO BUILDINGS

Because roaches are cosmopolitan, some one or more species of those troublesome in commissaries are to be found in almost all ports and inland cities. Most of the species are capable of flight and sometimes fly into buildings and onto moored vessels, being attracted to lights on warm, humid nights. Cockroaches have been observed to migrate in droves from place to place, and many undoubtedly do crawl in through door and window openings, particularly in warmer portions of the country where roaches find little difficulty in living continuously outdoors. Establishment in buildings is probably due more, however, to the result of their nocturnal habit which causes them to remain rather quietly in sheltered, darkened spots during the daytime. During their nightly foraging for food they often find their way into loosely packed cartons of packages in the store or warehouse, and there remain hidden while the consignments are delivered to property clerks or commissaries the following day.

HABITS OF ROACHES

Roaches are nocturnal in habit, as mentioned above. They hide during the day in sheltered, darkened places where they congregate in large numbers when infestations are heavy. They usually hide near sinks, drainboards, behind wall cabinets and radiators, under loose door and window trim. They forage at night when all is dark and still. If disturbed, they run rapidly for concealment and disappear through cracks, holes in walls, down along water or steam pipes and similar openings. They may thus congregate beneath floorings, in wall spaces, sometimes forming masses so dense that they obscure the surface upon which they rest and over which they move like herds of cattle when disturbed. After dark, when they have come into the room to feed, enter suddenly, turn on the lights and watch them run for their hiding places. Knowledge of where they conceal themselves is usually the key to their control.

The method of laying eggs and the nocturnal habit of roaches are important factors to be considered in control operations. The eggs are laid not singly or in unprotected groups about cracks and foods, but in chitinous, more or less rigid capsules which the mother roach usually glues to various surfaces where they are out of sight. The eggs are encased in the capsule within the body of the roach before the female deposits the capsule and emits the gummy solution which causes it to adhere to the object upon which it is deposited. An exception to the habit of most roaches in gluing their egg capsules to surfaces is that of the German roach which carries the capsule partially extruded from the body until the eggs hatch or are about to hatch, when the capsule is dropped loosely on any surface.

SPECIES OF ROACHES TROUBLESOME

There are four species of roaches that may become abundant or persistent annoyers about defense establishments. The largest of all species is the American roach (Periplaneta americana Linn.) (Fig. 1). It is light brown, from $1\frac{1}{2}$ to 2 inches long when fully grown, and all adults have long powerful, reddish-brown wings with which they fly readily. The oriental roach (Blatta orientalis Linn.) (Fig. 2), is often called the "black beetle",

because it is entirely black or deep brownish black; it is about $1\frac{1}{4}$ inches long when well grown, rather sluggish in habits and thrives best in very damp places. The females have wings only partially developed and cannot fly. The German roach (Blattella germanica Linn.) (Fig. 3), is never more than $\frac{5}{8}$ of an inch long when well grown and is one of our most common roaches in buildings. Its light brown color is offset on the back between the head and the wings with two dark parallel blackish stripes. Its wings are uniformly light brown and fully developed. The brown banded roach (Supella supellectilium Serv.) (Fig. 4), is a species quite like the German roach, but thrives best in more tropical situations, particularly in the southern half of the United States and Central America. The females are seldom longer than $\frac{3}{8}$ of an inch when well grown, but the males may become about $\frac{1}{2}$ an inch long. The distinguishing features of this roach are the broader body of the female, the absence of the two blackish stripes on the back of the body, but especially the presence of two cross bands of light yellow, one at the base of the wings and the other farther back on the well developed reddish brown but often paler wings. The young tropical roaches are very easily distinguished by two bright yellow or whitish transverse bands on the abdomen.

LENGTH OF DEVELOPMENT

Roaches are much slower in development than other insects troublesome about pantries and kitchens. They live in the adult state for long periods. The fully grown female of the American roach at room temperatures has been known to live 441 days and to produce 58 capsules averaging 14 eggs each, and the young require from about 30 to 60 days to mature sufficiently to leave the egg and another 285 to 971 days to arrive at adult growth. The German roach thrives under warmer conditions and has been known to complete its life cycle from egg to adult in 90 days. But adult females have lived 260 days, laid 6 capsules averaging in content 30 eggs each which hatched in 28 days at 76°F., the young requiring another 103 days at the same temperature to reach the adult stage. The growth of roaches is

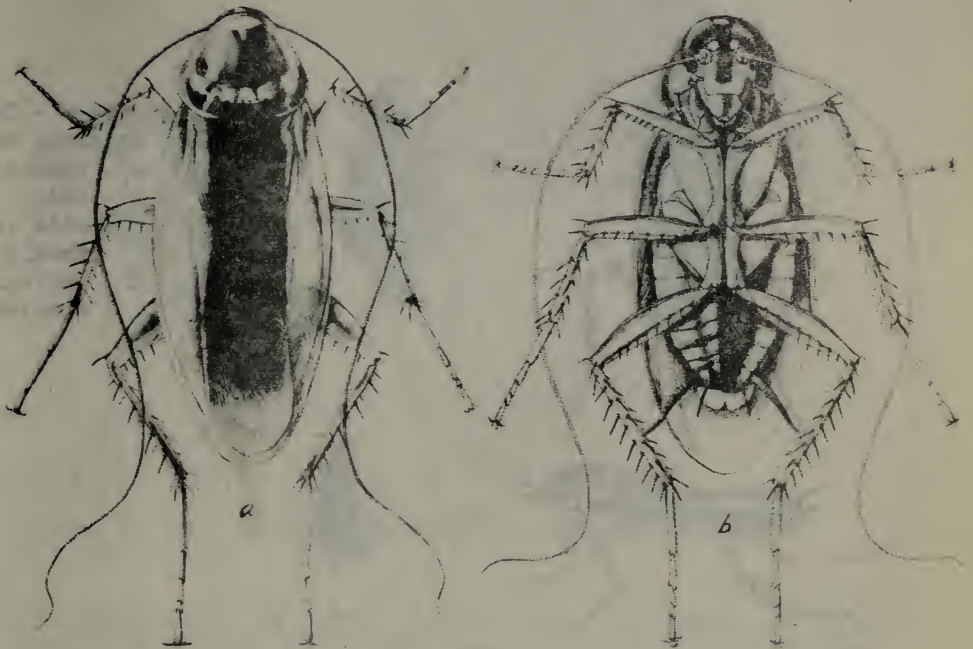


Figure 1 - The American Roach; a - dorsal view; b - ventral view.

influenced greatly by temperature, humidity and the food available, and their development therefore is subject to such great variations in length of time that eggs, young and adults are apt to be present at all seasons of the year in and about commissaries inhabited by the more troublesome species of roaches.

PREVENTION OF INFESTATIONS

Watch Incoming Supplies

One of the best ways to prevent roach establishment in buildings is to watch carefully all baskets or boxes of food supplies, clothing and laundry brought into

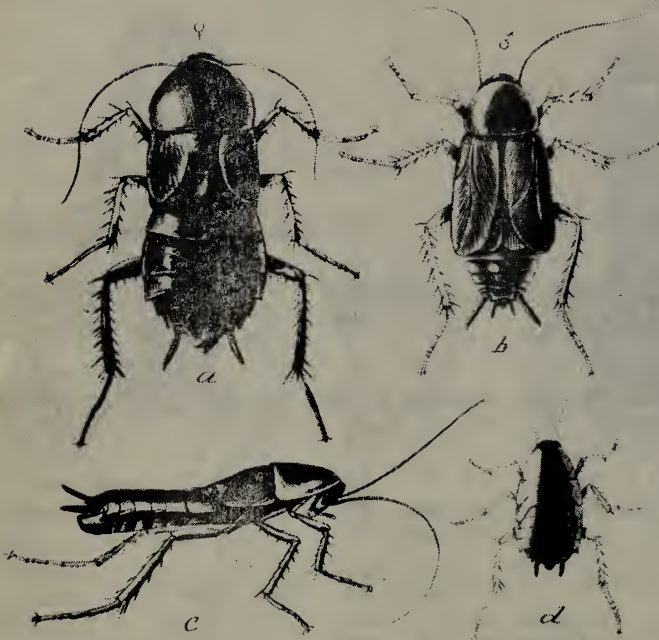


Figure 2 - The Oriental Roach;
a - female;
b - male;
c - side view of female;
d - half-grown specimen.



Figure 3 - The German Roach; a - first stage; b - second stage;
c - third stage; d - fourth stage; e - adult; f - female with egg case; g - egg case (enlarged); h - adult with wings spread.

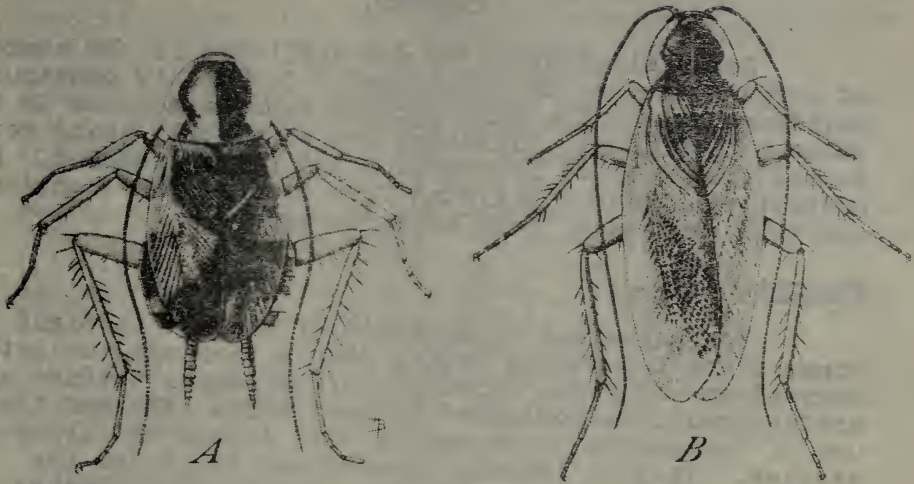


Figure 4 - The brown-banded roach; a - female; b - male.

the building. Roaches hidden among packages and about clothing are so frequently carried from place to place it is well to have a receiving room for incoming supplies in which they can be unpacked. Kill stray roaches found in such incoming materials with a fly swatter, or if they are encountered unexpectedly and no weapon is at hand, crush them under foot or in any other manner possible.

Tight Screening

Tight screening of windows, doors and ventilators keeps out many roaches in the warmer portions of the country. Supplement this by eliminating all unnecessary places that can be used as hiding places by roaches. Sometimes eliminating small openings leading to wall or floor spaces will confine roaches to the room itself where they can be fought far more effectively.

Cleanliness

Thorough cleanliness plays its part in roach control when supplemented with the covering of food supplies so roaches cannot get at them.

CONTROL

Roach elimination is not difficult if the sources of infestation can be controlled. In loosely constructed buildings or where a mild climate permits roaches to develop out of doors, buildings are constantly being reinfested from outside by crawling and flying roaches. No control will keep a building free from roaches continuously if sources of reinfestation exist.

Fumigation

For immediate elimination of roaches in tight rooms there is nothing better than a thorough fumigation carried on under the direction of personnel trained and professionally experienced in such work. Whether the use of fumigation is warranted will depend on circumstances. In more loosely constructed buildings the fumigant usually escapes so fast the eggs of roaches, protected in the egg capsules, are not always killed and a second fumigation about 3 or 4 weeks later may be necessary. The dosage depends on the construction of the building. A 12-hour fumigation, using 12 ounces of sodium cyanide for each 1000 cubic feet is recommended. Caution: Hydrocyanic acid gas is a deadly poison and should be used only by experienced operators exercising all safety requirements enumerated in Circular No. 22. Most camps can be fumigated safely with hydrocyanic acid gas provided the structure is detached and 15 to 20 feet distant from other buildings. The structure must be completely vacated and guarded during the 6 to 8 hours of fumigation and until thoroughly ventilated.

Sodium Fluoride Powder

Sodium fluoride powder is the best, all-round cockroach remedy. It is poisonous to man if taken internally in sufficient amounts and it should be kept, plainly labeled, out of food and away from children and pets, but if used carefully in roach control no harm will follow. It may be applied with a small duster or bellows, or better, with a modern electric power duster with an extension rod so shaped that the powder can be blown into the hiding places rather than about the room. It can be sprinkled by hand along the back of shelving and drainboards where roaches run most frequently, but

dusting the hiding or congregating places affects more roaches at one time and they die more rapidly when the powder is blown directly upon them; however, when the powder is placed where the roaches run over it, it kills chiefly as a stomach poison. It sticks to their bodies and in cleaning themselves after running over it they transfer the powder to their mouths and thus swallow it. As a stomach poison it is slow but sure. Sodium fluoride powder is the basis of most effective roach powders sold under various trade names. It remains effective indefinitely in dry situations but in very damp places it may cake over and become useless. Applying the powder in the evening is advised, and it is best not to clean it up for 2 or 3 days. The application should be repeated at intervals of a week or two until all roaches disappear. Usually one or two thorough treatments are sufficient.

Pyrethrum Powder

Fresh, finely, ground pyrethrum powder, used in the same way as sodium fluoride, is excellent when thoroughly applied to the hiding places or to the roaches themselves. It quickly stupefies the roaches. They usually turn on their backs, and although they live for some time they eventually die if thoroughly treated. The stupefied roaches should be swept up and destroyed several hours after treatment before those least affected can revive. Pyrethrum powder is a safe remedy and will not injure man or pets. Upon exposure to air it loses its effectiveness after some days, and only fresh, finely ground powder should be used. It can be most thoroughly applied by means of an electrically operated dusting machine with which it can be forced easily in most of the hiding places.

Borax

Borax powder can be used in the same manner as sodium fluoride and pyrethrum powders. It is not poisonous and is not so effective, but when used in office rooms or elsewhere where there is little food for roaches, borax, either as a powder or made with inert materials into tablets, has usually given satisfactory results.

Phosphorus Pastes

Phosphorus pastes, obtainable at drug stores, are excellent for the control of roaches, particularly the larger species and the tropical roach. If the paste is spread on a small piece of flexible cardboard, which is then rolled into a cylinder with the paste on the inside and with the cylinder held firm with a rubber band or string, it can be inserted behind books, etc., without danger of soiling anything; or the cylinders or other containers can be tacked to the back of cabinet drawers, the interior framework or springs of upholstered furniture, or in other situations where they will not be seen. Phosphorus pastes are especially effective in damp climates and are often smeared in basements directly on foundation walls and rafters where the persons cannot rub against the paste. Phosphorus is extremely poisonous to man and should be used with great caution.

Sprays

Sprays consisting largely of kerosene oil and pyrethrum extract (odorless oil 19 gallons, 1 gallon of pyrethrum extract (20-1)) are excellent for killing roaches. They kill only by contact; hence the roaches must be hit and made wet by the spray. As roaches run rapidly sprays are not so easily applied to isolated individuals. If possible, the liquid should be sprayed into the hiding places where more of the roaches can be hit at one time. Much good can be done by applying sprays with a hand sprayer, but the liquid can be introduced into hiding places more effectively with a power sprayer.

Vaporizing Machines

There are on the market today various makes of machines, operated by electricity, which break up oil-pyrethrum preparations and some other sprays into a fine mist that can be made to fill a room. This mist is very irritating to roaches and causes them to run out of their hiding places into the open, where they die if a sufficient amount of the spray particles comes in contact with their bodies. By repeated applications roaches can be controlled by the spray from these machines in modern tight rooms. Vaporizers have a tendency to drive roaches into surrounding rooms; hence before using them, all openings to the

exterior should be closed so that the roaches cannot escape from the room under treatment. When loosely constructed rooms are infested, many roaches are in the surrounding wall spaces and the irritating vapors penetrate these only sufficiently to annoy the roaches and drive many to parts of the building to which they normally would not spread, thus complicating the problem of control.

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